



## SEQUENCE LISTING

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RENTZ, ANDREAS

<120> FATTY ACID DESATURASE GENE FROM PLANTS

<130> 50669

<140> 10/069,772

<141> 2002-02-28

<150> PCT/EP00/08222

<151> 2000-08-23

<150> DE 199 41 609.5

<151> 1999-09-01

<160> 19

<170> PatentIn Ver. 3.3

<210> 1

<211> 1285

<212> DNA

<213> Calendula officinalis

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<221> CDS

<222> (42)..(1175)

<400> 1

aaaagctcac ttctctgtga gggttaattat atatcaacaa c atg ggt gct ggt ggt 56  
Met Gly Ala Gly Gly  
1 5

cgg atg tcg gat cca tct gag gga aaa aac atc ctt gaa cgt gtg cca 104  
Arg Met Ser Asp Pro Ser Glu Gly Lys Asn Ile Leu Glu Arg Val Pro  
10 15 20

gtc gat cca ccg ttc acg tta agc gat ctg aag aaa gcg att cct acc 152  
Val Asp Pro Pro Phe Thr Leu Ser Asp Leu Lys Lys Ala Ile Pro Thr  
25 30 35

cat tgc ttt gag cga tct gtc atc cgg tca tca tac tat gtt gtt cat 200  
His Cys Phe Glu Arg Ser Val Ile Arg Ser Ser Tyr Tyr Val Val His  
40 45 50

gat ctc att gtt gcc tat gtc ttc tac tac ctt gca aac acg tat atc 248  
Asp Leu Ile Val Ala Tyr Val Phe Tyr Tyr Leu Ala Asn Thr Tyr Ile  
55 60 65

cct ctt att cct aca cct ctg gct tac cta gca tgg ccc gtt tac tgg 296  
Pro Leu Ile Pro Thr Pro Leu Ala Tyr Leu Ala Trp Pro Val Tyr Trp  
70 75 80 85

ttt tgt caa gct agc atc ctc acc ggc ctc tgg gtc atc ggt cac gaa	344
Phe Cys Gln Ala Ser Ile Leu Thr Gly Leu Trp Val Ile Gly His Glu	
90 95 100	
tgt ggt cac cat gca ttt agc gac tac cag ttg att gat gac att gtt	392
Cys Gly His His Ala Phe Ser Asp Tyr Gln Leu Ile Asp Asp Ile Val	
105 110 115	
gga ttc gtg ctc cat tcg gct ctc ctc acc ccg tat ttc tct tgg aaa	440
Gly Phe Val Leu His Ser Ala Leu Leu Thr Pro Tyr Phe Ser Trp Lys	
120 125 130	
tat agc cac agg aat cac cac gcc aac aca aat tca ctc gat aac gat	488
Tyr Ser His Arg Asn His His Ala Asn Thr Asn Ser Leu Asp Asn Asp	
135 140 145	
gaa gtt tac att cct aaa cgt aag tcg aag gtc aag att tat tcc aaa	536
Glu Val Tyr Ile Pro Lys Arg Lys Ser Lys Val Lys Ile Tyr Ser Lys	
150 155 160 165	
ctt ctt aac aat cca ccc ggg cga gtg ttc act ttg gtg ttt cgg ttg	584
Leu Leu Asn Asn Pro Pro Gly Arg Val Phe Thr Leu Val Phe Arg Leu	
170 175 180	
act tta gga ttt ccg tta tac ctc tta act aat atc tcg ggc aag aaa	632
Thr Leu Gly Phe Pro Leu Tyr Leu Leu Thr Asn Ile Ser Gly Lys Lys	
185 190 195	
tac ggg agg ttt gcc aac cac ttt gat ccc atg agt cca att ttc aac	680
Tyr Gly Arg Phe Ala Asn His Phe Asp Pro Met Ser Pro Ile Phe Asn	
200 205 210	
gat cgt gaa cgc gtt caa gtt ttg cta tcc gat ttc ggt ctt ctc gct	728
Asp Arg Glu Arg Val Gln Val Leu Leu Ser Asp Phe Gly Leu Leu Ala	
215 220 225	
gta ttt tat gca atc aag ctt ctt gta gca gca aaa ggg gca gct tgg	776
Val Phe Tyr Ala Ile Lys Leu Leu Val Ala Ala Lys Gly Ala Ala Trp	
230 235 240 245	
gta atc aac atg tac gca att cca gta cta ggt gta agc gtg ttc ttc	824
Val Ile Asn Met Tyr Ala Ile Pro Val Leu Gly Val Ser Val Phe Phe	
250 255 260	
gtt ttg atc aca tat ttg cac cac acc cat ctc tca ctc cct cat tat	872
Val Leu Ile Thr Tyr Leu His His Thr His Leu Ser Leu Pro His Tyr	
265 270 275	
gat tca acc gaa tgg aac tgg atc aaa ggc gcc tta tca aca atc gat	920
Asp Ser Thr Glu Trp Asn Trp Ile Lys Gly Ala Leu Ser Thr Ile Asp	
280 285 290	
agg gat ttc ggg ttc ctg aat cgg gtt ttc cac gac gtt aca cac act	968
Arg Asp Phe Gly Phe Leu Asn Arg Val Phe His Asp Val Thr His Thr	
295 300 305	

cac gtc ttg cat cat ttg atc tca tac att cca cat tat cat gca aag 1016  
 His Val Leu His His Leu Ile Ser Tyr Ile Pro His Tyr His Ala Lys  
 310 315 320 325

gaa gca agg gat gca atc aag cca gtg ttg ggc gag tac tat aaa atc 1064  
 Glu Ala Arg Asp Ala Ile Lys Pro Val Leu Gly Glu Tyr Tyr Lys Ile  
 330 335 340

gac agg act cca att ttc aaa gca atg tat aga gag gct aag gaa tgc 1112  
 Asp Arg Thr Pro Ile Phe Lys Ala Met Tyr Arg Glu Ala Lys Glu Cys  
 345 350 355

atc tac atc gag ccc gat gag gat agc gag cac aaa ggt gtg ttc tgg 1160  
 Ile Tyr Ile Glu Pro Asp Glu Asp Ser Glu His Lys Gly Val Phe Trp  
 360 365 370

tac cac aag atg taa tcaaaaagggt gtatgtcaat gcaattgtat gcttaattaa 1215  
 Tyr His Lys Met  
 375

gttggttaaac tttctattcc gtgtaataaa ttatcattaa gagaaaaaaaa aaaaaaaaaa 1275

aaaaaaaaaa 1285

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<211> 377

<212> PRT

<213> Calendula officinalis

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Leu Glu Arg Val Pro Val Asp Pro Pro Phe Thr Leu Ser Asp Leu Lys  
 20 25 30

Lys Ala Ile Pro Thr His Cys Phe Glu Arg Ser Val Ile Arg Ser Ser  
 35 40 45

Tyr Tyr Val Val His Asp Leu Ile Val Ala Tyr Val Phe Tyr Tyr Leu  
 50 55 60

Ala Asn Thr Tyr Ile Pro Leu Ile Pro Thr Pro Leu Ala Tyr Leu Ala  
 65 70 75 80

Trp Pro Val Tyr Trp Phe Cys Gln Ala Ser Ile Leu Thr Gly Leu Trp  
 85 90 95

Val Ile Gly His Glu Cys Gly His His Ala Phe Ser Asp Tyr Gln Leu  
 100 105 110

Ile Asp Asp Ile Val Gly Phe Val Leu His Ser Ala Leu Leu Thr Pro  
 115 120 125

Tyr Phe Ser Trp Lys Tyr Ser His Arg Asn His His Ala Asn Thr Asn  
 130 135 140

Ser Leu Asp Asn Asp Glu Val Tyr Ile Pro Lys Arg Lys Ser Lys Val  
 145 150 155 160  
 Lys Ile Tyr Ser Lys Leu Leu Asn Asn Pro Pro Gly Arg Val Phe Thr  
 165 170 175  
 Leu Val Phe Arg Leu Thr Leu Gly Phe Pro Leu Tyr Leu Leu Thr Asn  
 180 185 190  
 Ile Ser Gly Lys Lys Tyr Gly Arg Phe Ala Asn His Phe Asp Pro Met  
 195 200 205  
 Ser Pro Ile Phe Asn Asp Arg Glu Arg Val Gln Val Leu Leu Ser Asp  
 210 215 220  
 Phe Gly Leu Leu Ala Val Phe Tyr Ala Ile Lys Leu Leu Val Ala Ala  
 225 230 235 240  
 Lys Gly Ala Ala Trp Val Ile Asn Met Tyr Ala Ile Pro Val Leu Gly  
 245 250 255  
 Val Ser Val Phe Phe Val Leu Ile Thr Tyr Leu His His Thr His Leu  
 260 265 270  
 Ser Leu Pro His Tyr Asp Ser Thr Glu Trp Asn Trp Ile Lys Gly Ala  
 275 280 285  
 Leu Ser Thr Ile Asp Arg Asp Phe Gly Phe Leu Asn Arg Val Phe His  
 290 295 300  
 Asp Val Thr His Thr His Val Leu His His Leu Ile Ser Tyr Ile Pro  
 305 310 315 320  
 His Tyr His Ala Lys Glu Ala Arg Asp Ala Ile Lys Pro Val Leu Gly  
 325 330 335  
 Glu Tyr Tyr Lys Ile Asp Arg Thr Pro Ile Phe Lys Ala Met Tyr Arg  
 340 345 350  
 Glu Ala Lys Glu Cys Ile Tyr Ile Glu Pro Asp Glu Asp Ser Glu His  
 355 360 365  
 Lys Gly Val Phe Trp Tyr His Lys Met  
 370 375

<210> 3

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic  
primer

<220>  
<221> modified\_base  
<222> (12)  
<223> Inosine  
  
<400> 3  
ccdtayttct cntggaarww hagycaycg 29  
  
<210> 4  
<211> 27  
<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence: Synthetic  
primer  
  
<220>  
<221> modified\_base  
<222> (13)  
<223> Inosine  
  
<400> 4  
ccartyccay tcngwbgart crtartg 27  
  
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<213> Artificial Sequence  
  
<220>  
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primer  
  
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gtgagggagt gagagatggg tgtggtgc 28  
  
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<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence: Synthetic  
primer  
  
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aacacactta cacctagtagc tggaattg 28  
  
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<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic primer  
  
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tattccaaac ttcttaacaa tccacccg 28  
  
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<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence: Synthetic primer  
  
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caattccagt actaggtgta agtgtgtt 28  
  
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<212> DNA  
<213> Artificial Sequence  
  
<220>  
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<212> DNA  
<213> Artificial Sequence  
  
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<223> Description of Artificial Sequence: Synthetic primer  
  
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attactcgag tgacatacac ctttttgatt acatcttg 38  
  
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<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence: Synthetic primer  
  
<400> 11  
cgtcttctc gctgtatt 18

<210> 12  
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 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 primer

<400> 12  
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<210> 13  
 <211> 34  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 primer

<400> 13  
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<210> 14  
 <211> 39  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 primer

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39

<210> 15  
 <211> 375  
 <212> PRT  
 <213> Crepis alpina

<400> 15  
 Met Gly Gly Gly Gly Arg Gly Arg Thr Ser Gln Lys Pro Leu Met Glu  
   1                  5                  10                  15  
 Arg Val Ser Val Asp Pro Pro Phe Thr Val Ser Asp Leu Lys Gln Ala  
                   20                  25                  30  
 Ile Pro Pro His Cys Phe Lys Arg Ser Val Ile Arg Ser Ser Tyr Tyr  
           35                  40                  45  
 Ile Val His Asp Ala Ile Ile Ala Tyr Ile Phe Tyr Phe Leu Ala Asp  
   50                  55                  60

Lys Tyr Ile Pro Ile Leu Pro Ala Pro Leu Ala Tyr Leu Ala Trp Pro  
 65 70 75 80  
 Leu Tyr Trp Phe Cys Gln Ala Ser Ile Leu Thr Gly Leu Trp Val Ile  
 85 90 95  
 Gly His Glu Cys Gly His His Ala Phe Ser Asp Tyr Gln Trp Val Asp  
 100 105 110  
 Asp Thr Val Gly Phe Ile Leu His Ser Phe Leu Met Thr Pro Tyr Phe  
 115 120 125  
 Ser Trp Lys Tyr Ser His Arg Asn His His Ala Asn Thr Asn Ser Leu  
 130 135 140  
 Asp Asn Asp Glu Val Tyr Ile Pro Lys Ser Lys Ala Lys Val Ala Leu  
 145 150 155 160  
 Tyr Tyr Lys Val Leu Asn His Pro Pro Gly Arg Leu Leu Ile Met Phe  
 165 170 175  
 Ile Thr Phe Thr Leu Gly Phe Pro Leu Tyr Leu Phe Thr Asn Ile Ser  
 180 185 190  
 Gly Lys Lys Tyr Glu Arg Phe Ala Asn His Phe Asp Pro Met Ser Pro  
 195 200 205  
 Ile Phe Lys Glu Arg Glu Arg Phe Gln Val Leu Leu Ser Asp Leu Gly-  
 210 215 220  
 Leu Leu Ala Val Leu Tyr Gly Val Lys Leu Ala Val Ala Ala Lys Gly  
 225 230 235 240  
 Ala Ala Trp Val Thr Cys Ile Tyr Gly Ile Pro Val Leu Gly Val Phe  
 245 250 255  
 Ile Phe Phe Asp Ile Ile Thr Tyr Leu His His Thr His Leu Ser Leu  
 260 265 270  
 Pro His Tyr Asp Ser Ser Glu Trp Asn Trp Leu Arg Gly Ala Leu Ser  
 275 280 285  
 Thr Ile Asp Arg Asp Phe Gly Phe Leu Asn Ser Val Leu His Asp Val  
 290 295 300  
 Thr His Thr His Val Met His His Leu Phe Ser Tyr Ile Pro His Tyr  
 305 310 315 320  
 His Ala Lys Glu Ala Arg Asp Ala Ile Asn Thr Val Leu Gly Asp Phe  
 325 330 335  
 Tyr Lys Ile Asp Arg Thr Pro Ile Leu Lys Ala Met Trp Arg Glu Ala  
 340 345 350  
 Lys Glu Cys Ile Phe Ile Glu Pro Glu Lys Gly Arg Glu Ser Lys Gly  
 355 360 365



Val Tyr Trp Tyr Asn Lys Phe  
370 375

<210> 16

<211> 374

<212> PRT

<213> Crepis palaestina

<400> 16

Met Gly Ala Gly Gly Arg Gly Arg Thr Ser Glu Lys Ser Val Met Glu  
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Arg Val Ser Val Asp Pro Val Thr Phe Ser Leu Ser Glu Leu Lys Gln  
20 25 30

Ala Ile Pro Pro His Cys Phe Gln Arg Ser Val Ile Arg Ser Ser Tyr  
35 40 45

Tyr Val Val Gln Asp Leu Ile Ile Ala Tyr Ile Phe Tyr Phe Leu Ala  
50 55 60

Asn Thr Tyr Ile Pro Thr Leu Pro Thr Ser Leu Ala Tyr Leu Ala Trp  
65 70 75 80

Pro Val Tyr Trp Phe Cys Gln Ala Ser Val Leu Thr Gly Leu Trp Ile  
85 90 95

Leu Gly His Glu Cys Gly His His Ala Phe Ser Asn Tyr Thr Trp Phe  
100 105 110

Asp Asp Thr Val Gly Phe Ile Leu His Ser Phe Leu Leu Thr Pro Tyr  
115 120 125

Phe Ser Trp Lys Phe Ser His Arg Asn His His Ser Asn Thr Ser Ser  
130 135 140

Ile Asp Asn Asp Glu Val Tyr Ile Pro Lys Ser Lys Ser Lys Leu Ala  
145 150 155 160

Arg Ile Tyr Lys Leu Leu Asn Asn Pro Pro Gly Arg Leu Leu Val Leu  
165 170 175

Ile Ile Met Phe Thr Leu Gly Phe Pro Leu Tyr Leu Leu Thr Asn Ile  
180 185 190

Ser Gly Lys Lys Tyr Asp Arg Phe Ala Asn His Phe Asp Pro Met Ser  
195 200 205

Pro Ile Phe Lys Glu Arg Glu Arg Phe Gln Val Phe Leu Ser Asp Leu  
210 215 220

Gly Leu Leu Ala Val Phe Tyr Gly Ile Lys Val Ala Val Ala Asn Lys  
225 230 235 240

Gly Ala Ala Trp Val Ala Cys Met Tyr Gly Val Pro Val Leu Gly Val  
245 250 255

Phe Thr Phe Phe Asp Val Ile Thr Phe Leu His His Thr His Gln Ser  
260 265 270

Ser Pro His Tyr Asp Ser Thr Glu Trp Asn Trp Ile Arg Gly Ala Leu  
275 280 285

Ser Ala Ile Asp Arg Asp Phe Gly Phe Leu Asn Ser Val Phe His Asp  
290 295 300

Val Thr His Thr His Val Met His His Leu Phe Ser Tyr Ile Pro His  
305 310 315 320

Tyr His Ala Lys Glu Ala Arg Asp Ala Ile Lys Pro Ile Leu Gly Asp  
325 330 335

Phe Tyr Met Ile Asp Arg Thr Pro Ile Leu Lys Ala Met Trp Arg Glu  
340 345 350

Gly Arg Glu Cys Met Tyr Ile Glu Pro Asp Ser Lys Leu Lys Gly Val  
355 360 365

Tyr Trp Tyr His Lys Leu  
370

<210> 17

<211> 383

<212> PRT

<213> Borago officinalis

<400> 17

Met Gly Gly Gly Gly Arg Met Pro Val Pro Thr Lys Gly Lys Lys Ser  
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Lys Ser Asp Val Phe Gln Arg Val Pro Ser Glu Lys Pro Pro Phe Thr  
20 25 30

Val Gly Asp Leu Lys Lys Val Ile Pro Pro His Cys Phe Gln Arg Ser  
35 40 45

Val Leu His Ser Phe Ser Tyr Val Val Tyr Asp Leu Val Ile Ala Ala  
50 55 60

Leu Phe Phe Tyr Thr Ala Ser Arg Tyr Ile His Leu Gln Pro His Pro  
65 70 75 80

Leu Ser Tyr Val Ala Trp Pro Leu Tyr Trp Phe Cys Gln Gly Ser Val  
85 90 95

Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe  
100 105 110

Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Leu Leu His Ser  
115 120 125

Ala Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His  
130 135 140

His	Ser	Asn	Thr	Gly	Ser	Leu	Glu	Arg	Asp	Glu	Val	Phe	Val	Pro	Lys	145	150	155	160
Lys	Arg	Ser	Gly	Ile	Ser	Trp	Ser	Ser	Glu	Tyr	Leu	Asn	Asn	Pro	Pro	165	170	175	
Gly	Arg	Val	Leu	Val	Leu	Leu	Val	Gln	Leu	Thr	Leu	Gly	Trp	Pro	Leu	180	185	190	
Tyr	Leu	Met	Phe	Asn	Val	Ser	Gly	Arg	Pro	Tyr	Asp	Arg	Phe	Ala	Cys	195	200	205	
His	Phe	Asp	Pro	Lys	Ser	Pro	Ile	Tyr	Asn	Asp	Arg	Glu	Arg	Leu	Gln	210	215	220	
Ile	Tyr	Ile	Ser	Asp	Ala	Gly	Ile	Val	Ala	Val	Met	Tyr	Gly	Leu	Tyr	225	230	235	240
Arg	Leu	Val	Ala	Ala	Lys	Gly	Val	Ala	Trp	Val	Val	Cys	Tyr	Tyr	Gly	245	250	255	
Val	Pro	Leu	Leu	Val	Val	Asn	Gly	Phe	Leu	Val	Leu	Ile	Thr	Tyr	Leu	260	265	270	
Gln	His	Thr	Gln	Pro	Ser	Leu	Pro	His	Tyr	Asp	Ser	Ser	Glu	Trp	Asp	275	280	285	
Trp	Leu	Lys	Gly	Ala	Leu	Ala	Thr	Val	Asp	Arg	Asp	Tyr	Gly	Phe	Leu	290	295	300	
Asn	Lys	Val	Leu	His	Asn	Ile	Thr	Asp	Thr	His	Val	Ala	His	His	Leu	305	310	315	320
Phe	Ser	Thr	Met	Pro	His	Tyr	His	Ala	Met	Glu	Ala	Thr	Lys	Ala	Ile	325	330	335	
Lys	Pro	Ile	Leu	Gly	Asp	Tyr	Tyr	Gln	Cys	Asp	Arg	Thr	Pro	Val	Phe	340	345	350	
Lys	Ala	Met	Tyr	Arg	Glu	Val	Lys	Glu	Cys	Ile	Tyr	Val	Glu	Ala	Asp	355	360	365	
Glu	Gly	Asp	Asn	Lys	Lys	Gly	Val	Phe	Trp	Tyr	Lys	Asn	Lys	Leu		370	375	380	

&lt;210&gt; 18

&lt;211&gt; 10

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Description of Artificial Sequence: Synthetic peptide

<220>  
<221> MOD\_RES  
<222> (7)  
<223> Tyr or Ile

<400> 18  
Pro Tyr Phe Ser Trp Lys Xaa Ser His Arg  
1 5 10

<210> 19  
<211> 9  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
peptide

<220>  
<221> MOD\_RES  
<222> (5)  
<223> Ser or Thr

<220>  
<221> MOD\_RES  
<222> (8)  
<223> Asp or Asn

<400> 19  
His Tyr Asp Ser Xaa Glu Trp Xaa Trp  
1 5